GRADE 6

Indiana Appeal for Prentice Hall Mathematics Course 1

Standards that Received a "2" Rating

Pearson Correlation Documentation

Standard	Definition	Lesson Covered	Notes
6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	Lessons 11-8, CC-11	Final format of lesson CC-11 included in appeal binder
6.NS.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express 36 + 8 as 4 (9 + 2).	Lessons 4-4, 4-7, CC-5	Final format of lesson CC-5 included in appeal binder
6.RP.3.c	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.	Lessons 7-7, CC-8	Final format of lesson CC-8 included in appeal binder

Standards that Received a "1" Rating

Pearson Correlation Documentation

Standard	Definition	Lesson Covered	Notes
6.RP.3.d	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	Lesson CC-9	The IN review of this standard was blank - Final format of lesson CC-9 included in appeal binder
6.NS.6.c	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	Lessons 11-1, 11-8, CC-11	Final format of lesson CC-11 included in appeal binder
6.EE.1	Write and evaluate numerical expressions involving whole-number exponents.	Lesson 4-2	The IN review of this standard was blank

6.SP.5.d	Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	Lesson CC-3	The IN review of this standard was blank - Final format of lesson CC-3 included in appeal binder
6.G.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\, w\, h$ and $V = b\, h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	Lessons 9-9, CC-10	Final format of lesson CC-10 included in appeal binder
6.G.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	Lesson CC-11	Final format of lesson CC-11 included in appeal binder
6.G.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	Lessons 9-4, Activity Lab 9-4	Review indicated that only lesson 9-4 was reviewed, not the Activity Lab
6.RP.3.a	Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	Lesson CC-7	Final format of lesson CC-7 included in appeal binder
6.EE.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).	Lesson CC-6	Final format of lesson CC-6 included in appeal binder
6.SP.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.	Lesson CC-4	Final format of lesson CC-4 included in appeal binder

6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	Lesson CC-2	Final format of lesson CC-2 included in appeal binder

Correlation of Standards for Mathematical Content
Prentice Hall Course 1

The following shows the alignment of *Prentice Hall Course 1* to the Grade 6 Common Core State Standards for Mathematics.

Standards for Mathematical Content	Where to find in *PH Course 1*
Ratios and Proportional Relationships	
Understand ratio concepts and use ratio reasoning to solve problems.	
6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*	7-1
6.RP.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*	7-2
6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.	CC-7
6.RP.3 .a Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	CC-7
6.RP.3 .b Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*	7-2, 7-4
6.RP.3 .c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.	7-7, CC-8
6.RP.3 .d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when	CC-9

	multiplying or dividing quantities.	

Standards for Mathematical Content	Where to find in *PH Course 1*
The Number System	
Apply and extend previous understandings of multiplication and division to divide fractions by fractions.	
6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*	6-3, 6-4, Activity lab 6-3a
Compute fluently with multi-digit numbers and find common factors and multiplies.	
6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.	1-9 Skills Handbook, p. 642
6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	1-7, 1-8, 1-9
6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).*	4-4, 4-7, CC-5
Apply and extend previous understandings of numbers to the system of rational numbers.	
6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	11-1
6.NS.6 Understand a rational number as a point on the number	11-1, 11-2,

	line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	11-8	
6.NS.6 .a	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.	11-1, 11-4	
6.NS.6 .b	Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.	11-8	
6.NS.6 .c	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	11-1, 11-8, CC-11	
6.NS.7	Understand ordering and absolute value of rational numbers.	11-1, 11-2,	
6.NS.7 .a	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right.*	11-2	
6.NS.7 .b	Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write $-3°C > -7°C$ to express the fact that $-3°C$ is warmer than $-7°C$.*	11-2	
6.NS.7 .c	Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of -30 dollars, write $|-30| = 30$ to describe the size of the debt in dollars.*	11-2	
6.NS.7 .d	Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.*	11-1, CC-11	
6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	11-8, CC-11	

Standards for Mathematical Content	Where to find in *PH Course 1*
Expressions and Equations	
Apply and extend previous understandings of arithmetic to algebraic expressions.	
6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.	4-2
6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.	1-3, 1-4, 1-7, 1-8, 1-9, 3-2, 3-3, 3-8, 4-2, 9-6, 9-9, 9-10
6.EE.2.a Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 − y.*	3-3
6.EE.2.b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*	1-3, 1-4, 1-7, 1-8, 1-9, 3-3, 3-8
6.EE.2.c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas V = s³ and A = 6 s² to find the volume and surface area of a cube with sides of length s = 1/2.*	3-2, 4-2, 9-6, 9-9, 9-10
6.EE.3 Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*	3-8, CC-6
6.EE.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*	CC-6

Reason about and solve one-variable equations and inequalities.		
6.EE.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	3-4, 3-5, 3-6, 3-7, 12-1, 12-2, 12-3
6.EE.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 5-6, 6-5, 12-1, 12-2, 12-3
6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.	3-4, 3-5, 3-6, 3-7, 5-6
6.EE.8	Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	12-2
Represent and analyze quantitative relationships between dependent and independent variables.		
6.EE.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.*	11-10, CC-12

Standards for Mathematical Content	Where to find in *PH Course 1*
Geometry	
Solve real-world and mathematical problems involving area, surface area, and volume.	
6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	9-4, Activity Lab 9-4a
6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\, w\, h$ and $V = b\, h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	9-9, CC-10
6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	CC-11
6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	9-8

Standards for Mathematical Content	Where to find in *PH Course 1*
Statistics and Probability	
Develop understanding of statistical variability.	
6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*	CC-4
6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	CC-2
6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	2-1, 2-2
Summarize and describe distributions.	
6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	2-3, 2-5, CC-1
6.SP.5 Summarize numerical data sets in relation to their context, such as by:	2-1, 2-2, 2-6, 2-7
6.SP.5.a Reporting the number of observations.	CC-1
6.SP.5.b Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.	2-6, 2-7, CC-1
6.SP.5.c Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	2-1, 2-2, 2-7, CC-3
6.SP.5.d Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	CC-3

Pacing for a Common Core Curriculum
with *Prentice Hall Course 1*

This pacing chart can help you plan your course as you implement a curriculum based on the Common Core State Standards (CCSS). The Chart indicates the Standard(s) for Mathematical Content that each lesson addresses and proposes pacing for each chapter. Included in the chart are supplemental lessons that offer in-depth coverage of certain standards. These lessons along with the lessons in the Student Edition provide comprehensive coverage of all of the Common Core State Standards for Grade 6.

The suggested number of days for each chapter is based on a traditional 45-minute class period and on a 90-minute block period. The total of 132 days of instruction leaves time for review and enrichment lessons, additional activity labs, assessments, and projects.

* Content to meet the Grade 6 Common Core State Standards
+ Reviews content from previous years
∞Content for enrichment

	Standards of Mathematical Content	On-Level	Advanced
Chapter 1 Whole Numbers and Decimals Traditional 12 days Block 6 days			
1-1 Understanding Whole Numbers	Reviews 4.NBT.2	+	
1-2 Estimating With Whole Numbers	Reviews 4.NBT.3	+	
1-3 Properties of Numbers	6.EE.2, 6.EE.2.b	*	*
1-4 Order of Operations	6.EE.2, 6.EE.2.b	*	*
1-5 Understanding Decimals	Reviews 5.NBT.1	+	
1-6 Comparing and Ordering Decimals	Reviews 5.NBT.3	+	
1-7 Adding and Subtracting Decimals	6.NS.3, 6.EE.2, 6.EE.2.b	*	*
1-8 Multiplying Decimals	6.NS.3, 6.EE.2, 6.EE.2.b	*	*
1-8b Activity Lab: Multiplying and Dividing Decimals by 10, 100, and 1,000	6.NS.3	*	*
1-9 Dividing Decimals	6.NS.2, 6.NS.3, 6.EE.2, 6.EE.2.b	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 2 Data and Graphs Block 10 days		**Traditional 20 days**	
2-1 Finding the Mean	6.SP.3, 6.SP.5, 6.SP.5.c	*	*
2-2 Median and Mode	6.SP.3, 6.SP.5, 6.SP.5.c	*	*
2-3 Frequency Tables and Line Plots	6.SP.4	*	*
CC-1 Box and Whisker Plots	6.SP.4, 6.SP.5.a, 6.SP.5.b	*	*
2-4 Bar Graphs and Line Graphs	Reviews 3.MD.3	+	
CC-2 Histograms	6.SP.4, 6.SP.5, 6.SP.5.a, 6.SP.5.b	*	*
CC-3 Shape and Variability of Data	6.SP.2, 6.SP.5.c, 6.SP.5.d	*	*
2-5 Using Spreadsheets to Organize Data	6.SP.4	*	*
2-6 Stem-and-Leaf Plots	6.SP.5, 6.SP.5.b	*	*
2-7 Misleading Graphs and Statistics	6.SP.5, 6.SP.5.b, 6.SP.5.c	*	*
CC-4 Statistical Questions	6.SP.1	*	*
Chapter 3 Patterns and Variables days		**Traditional 16 days Block 8**	
3-1 Describing a Pattern	Reviews 5.OA.3	+	
3-2 Variables and Expressions	6.EE.2, 6.EE.2.c, 6.EE.6	*	*
3-3 Writing Algebraic Expressions	6.EE.2, 6.EE.2.a, 6.EE.2.b, 6.EE.6	*	*
3-4 Using Number Sense to Solve One-Step Equations	6.EE.5, 6.EE.6, 6.EE.7	*	*
3-5 Solving Addition Equations	6.EE.5, 6.EE.6, 6.EE.7	*	*
3-6 Solving Subtraction Equations	6.EE.5, 6.EE.6, 6.EE.7	*	*

	Standards of Mathematical Content	On-Level	Advanced
3-7 Solving Multiplication and Division Equations	6.EE.5, 6.EE.6, 6.EE.7	*	*
3-8 The Distributive Property	6.EE.2, 6.EE.2.b, 6.EE.3	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 4 Number Theory and Fractions days	**Traditional 10 days Block 5**		
4-1 Divisibility and Mental Math		+	
4-2 Exponents	6.EE.1, 6.EE.2 6.EE.2.c	*	*
4-3 Prime Numbers and Prime Factorization	Prepares for 6.NS.4	+	
4-4 Greatest Common Factor	6.NS.4	*	*
CC-5 Expressions and the Distributive Property	6.NS.4, 6.EE.3	*	*
CC-6 Equivalent Expressions	6.EE.3, 6.EE.4	*	*
4-5 Equivalent Fractions	Reviews 4.NF.1	+	
4-6 Mixed Numbers and Improper Fractions	Reviews 4.NF.3.c	+	
4-7 Least Common Multiple	6.NS.4	*	*
4-8 Comparing and Ordering Fractions	Reviews 4.NF.2	+	
4-9 Fractions and Decimals	Reviews 4.NF.6	+	
Chapter 5 Adding and Subtracting Fractions days	**Traditional 4 days Block 2**		
5-1 Estimating Sums and Differences	Reviews 5.NF.2	+	
5-2 Fractions With Like Denominators	Reviews 4.NF.3.a	+	
5-3 Fractions With Unlike Denominators	Reviews 5.NF.1	+	+
5-4 Adding Mixed Numbers	Reviews 4NF.3.c, 5.NF.1	+	
5-5 Subtracting Mixed Numbers	Reviews 4NF.3.c, 5.NF.1	+	
5-6 Equations With Fractions	6.EE.6, 6.EE.7	*	*
5-7 Measuring Elapsed Time		+	

	Standards of Mathematical Content	On-Level	Advanced
Chapter 6 Multiplying and Dividing Fractions Traditional 10 days Block 5 days			
6-1 Multiplying Fractions	Reviews 5.NF.4.a	+	
6-2 Multiplying Mixed Numbers	Reviews 5.NF.6	+	+
6-3a Activity Lab: Fraction Division	6.NS.1	*	*
6-3 Dividing Fractions	6.NS.1	*	*
6-4 Dividing Mixed Numbers	6.NS.1	*	*
6-5 Solving Fraction Equations by Multiplying	6.EE.6	*	*
6-6 The Customary System	Reviews 4.MD.1	+	+
6-7 Changing Units in the Customary System	6.RP.3.d	*	*
Chapter 7 Ratios, Proportions, and Percents Traditional 14 days Block 7 days			
7-1 Ratios	6.RP.1	*	*
7-2 Unit Rates	6.RP.2, 6.RP.3	*	*
CC-7 Ratios and Rates	6.RP.3, 6.RP.3.a	*	*
7-3 Understanding Proportions	6.RP.3.d	*	*
7-4 Solving Proportions	Prepares for 7.RP.3	∞	∞
7-5 Scale Drawings	Prepares for 7.G.1		∞
7-6 Percents, Fractions, and Decimals	Prepares for 6.RP.3.c	+	
7-7 Finding the Percent of a Number	6.RP.3.c	*	*
CC-8 Solving Percent Problems	6.RP.3.c	*	*
7-8 Circle Graphs	6.RP.3.c	*	*
7-9 Estimating With Percents			∞

	Standards of Mathematical Content	On-Level	Advanced
Chapter 8 Tools of Geometry	**Traditional 6 days Block 3 days**		
8-1 Points, Lines, Segments, and Rays	Reviews 4.G.1	+	
8-2 Angles	Reviews 4.G.1	+	
8-3 Special Pairs of Angles	Prepares for 7.G.5		∞
8-4 Classifying Triangles	Reviews 5.G.3	+	
8-5 Exploring and Classifying Polygons	Reviews 5.G.3	+	
8-6 Congruent and Similar Figures	Prepares for 8.G.2		∞
8-7 Line Symmetry	Reviews 4.G.3	+	
8-8 Transformations	Prepares for 8.G.3		∞
Chapter 9 Geometry and Measurement	**Traditional 14 days Block 7 days**		
9-1 Metric Units of Length, Mass, and Capacity	Reviews 4.MD.1	+	
9-2 Converting Units in the Metric System	Reviews 5.MD.1	+	
CC-9 Converting Measurement Units	6.RP.3.d	*	*
9-3 Perimeters and Areas of Rectangles	Reviews 4.MD.3	+	
9-4a Activity Lab: Comparing Areas	6.G.1	*	*
9-4 Areas of Parallelograms and Triangles	6.G.1	*	*
9-5 Circles and Circumference	Prepares for 7.G.4		∞
9-6 Area of a Circle	6.EE.2, 6.EE.2.c	*	*
9-7 Three-Dimensional Figures and Spatial Reasoning	Prepares for 6.G.4	+	
9-8 Surface Areas of Prisms	6.G.4	*	*
9-9a Activity Lab: Exploring Volume	Prepares for 6.G.2	+	+
9-9 Volumes of Rectangular Prisms	6.EE.2, 6.EE.2.c, 6.G.2	*	*

	Standards of Mathematical Content	On-Level	Advanced
CC-10 Prisms with Fractional Edge Lengths	6.G.2	*	*
9-10 Surface Areas and Volumes of Cylinders	6.EE.2, 6.EE.2.c	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 10 Exploring Probability	**Traditional 6 days Block 3 days**		
10-1 Tree Diagrams and the Counting Principle	Prepares for 7.SP.8.b	∞	∞
10-2 Probability	Prepares for 7.SP.5	∞	∞
10-3 Experimental Probability	Prepares for 7.SP.7.b	∞	∞
10-4 Making Predictions From Data	Prepares for 7.SP.2		∞
10-5 Independent Events	Prepares for 7.SP.8.a		∞
Chapter 11 Integers **days Block 7 days**	**Traditional 14**		
11-1 Exploring Integers	6.NS.5, 6.NS.6, 6.NS.6.a, 6.NS.6.c, 6.NS.7, 6.NS.7.c	*	*
11-2 Comparing and Ordering Integers	6.NS.6, 6.NS.7, 6.NS.7.a, 6.NS.6.b, 6.NS.7.d	*	*
11-3 Adding Integers	Prepares for 7.NS.1	∞	∞
11-4 Subtracting Integers	Prepares for 7.NS.1	∞	∞
11-5 Multiplying Integers	Prepares for 7.NS.2		∞
11-6 Dividing Integers	Prepares for 7.NS.2		∞
11-7 Solving Equations with Integers	Prepares for 7.NS.3		∞
11-8 Graphing in the Coordinate Plane	6.NS.6, 6.NS.6.b, 6.NS.6.c, 6.NS.8	*	*
CC-11 Rational Numbers and the Coordinate Plane	6.NS.6.c, 6.NS.7.d, 6.NS.8, 6.G.3	*	*
11-8 Extension: Reflections in the Coordinate Plane	6.NS.6.b	*	*

	Standards of Mathematical Content	On-Level	Advanced
11-9 Applications of Integers	Prepares for 7.NS.3	∞	∞
11-10 Graphing Functions	6.EE.9	*	*
CC-12 Variable and Equations	6.EE.9	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 12 Equations and Inequalities days	**Traditional 6 days Block 3**		
12-1 Solving Two-Step Equations	6.EE.5, 6.EE.6	*	*
12-2 Inequalities	6.EE.5, 6.EE.6, 6.EE.8	*	*
12-3 Solving One-Step Inequalities	6.EE.5, 6.EE.6	*	*
12-4 Exploring Square Roots and Rational Numbers	Prepares for 8.EE.2		∞
12-5 Introducing the Pythagorean Theorem	Prepares for 8.G.6		∞

Common Core Supplemental Lessons
Prentice Hall Course 1

The supplemental lessons listed below are available for *Prentice Hall Course 1.* These lessons ensure comprehensive coverage of all of the Grade 6 Standards for Mathematical Content that are in Common Core State Standards.

CC-1 Box and Whisker

CC-2 Histograms

CC-3 Shape and Variability of Data

CC-4 Statistical Questions

CC-5 Expressions and the Distributive Property

CC-6 Equivalent Expressions

CC-7 Ratios and Rates

CC-8 Solving Percent Problems

CC-9 Converting Measurement Units

CC-10 Prisms With Fractional Edge Lengths

CC-11 Rational Numbers and the Coordinate Plane

CC-12 Horizontal and Vertical Distances

CC-13 Variables and Equations

Box-and-Whisker Plots

A box-and-whisker plot shows how a set of data is distributed. The plot displays five numbers that summarize the data.

Box-and-Whisker Plot

ACTIVITY · **MATHEMATICAL PRACTICES**

A girls' basketball team had the following scores.

Total Points Per Game										
7	30	16	18	22	43	20	22	37	10	25

1. How many observations are represented by the data set?
2. Order the data values from least to greatest.

   7   10   16   18   20   22   22   25   30   37   43

   What is the *median* of the data?
3. Find the median of the lower half of the data.

   7   10   16   18   20

   This is the *lower quartile*.
4. Find the median of the upper half of the data.

   22   25   30   37   43

   This is the *upper quartile*.
5. What are the least and greatest values of the data?
6. Draw a box-and-whisker plot for the data.

   0   10   20   30   40   50
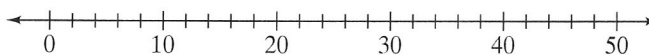
   Step 1   Plot the median, the upper and lower quartiles, and the least and greatest data values above the line.

   Step 2   Draw a box from the lower quartile to the upper quartile, with a vertical line through the median.

   Step 3   Draw lines, or whiskers, from the end of each side of the box to the least and greatest values.

   Step 4   Add a title to the graph.

Use after Lesson 2-3.

ACTIVITY ⒸMATHEMATICAL PRACTICES

The number of text messages sent by 12 students in one day is shown in the table below.

Number of Text Messages Per Student											
15	11	8	17	6	10	19	12	16	22	16	20

1. How many observations are represented by the data set?
2. What is the unit of measurement for this set of data?
3. In order to draw a box-and-whisker plot of this data, what scale will you use on the number line?
4. Draw a box-and-whisker plot to display the data.
5. Compare the number of text messages between the median and the lower quartile to the number of text messages between the median and the upper quartile.
6. What does the width of the box between the median and each of the quartiles show about the data?
7. Which of the following sets of numbers would make sense for the data in this problem? Explain.
   a. decimals   b. fractions
   c. integers   d. whole numbers

Test Prep Tip

The median of an even number of data values is the mean of the two middle values.

Exercises

1. The number of words per minute that students can type at the end of the first semester are shown in the line plot.

Semester 1 Keyboarding Class

```
                 X  X  X  X
   X  X  X     X X X  X  X  X      X
   _____
      55        60        65        70
            Words Per Minute
```
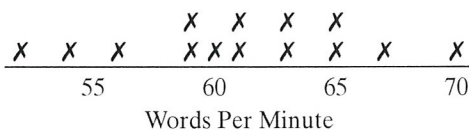
   a. How many observations are in the data set?
   b. Construct a box-and-whisker plot to represent the data.

2. The noontime temperatures in a city over two weeks are shown in the table.

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
72°F	64°F	82°F	75°F	65°F	68°F	70°F
71°F	74°F	73°F	68°F	70°F	69°F	75°F

Construct a box-and-whisker plot to represent the data.

Histograms

Test Prep Tip

Look at the range of the data when deciding the intervals for the bars.

A **histogram** is a type of bar graph that shows the frequency of data within given intervals. The label under each bar tells the range of numbers the bar represents, and the height represents the frequency. There is no space between the bars of a histogram.

ACTIVITY   **MATHEMATICAL PRACTICES**

The histogram shows the scores for a test that was given in Mr. Warren's English class.

Test Scores in English Class
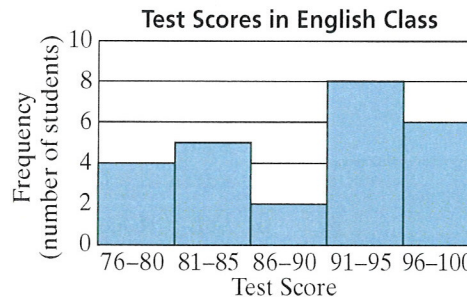
1. What does the bar labeled 81–85 represent?
2. What values are included in the interval 91–95?
3. Compare all of the intervals shown on the horizontal axis of the histogram. Do any of the intervals overlap or have a gap between them?
4. How many students are in the English class? Explain how you found your answer.
5. For each question below, answer the question or tell why the question cannot be answered.
   a. Which interval includes the most test scores?
   b. How many students had a test score of 95?
   c. How many students have test scores less than 86?
   d. How many students have test scores less than 88?
   e. What is the highest test score in the class?
   f. What is the mean test score?
   g. What is the median score?
   h. What is the greatest possible value for the range of the data?
6. Make a list of numbers that could represent the data graphed in the histogram.
7. Find the mean and median of your data.

Use after Lesson 2-4.

A frequency table can help you organize a data set.

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The table shows the number of minutes that Samuel spent on the computer each day for a month.

Samuel's Computer Time															
95	4	26	95	4	87	36	47	26	51	23	18	45	81	76
24	57	7	16	63	70	20	45	16	32	37	64	8	28	44

Samuel's Computer Time

Minutes per Day	Frequency

1. What is the unit of measurement for this data?
2. How many observations were made in this data set?
3. Choose intervals that will work well to display the data. Write the intervals in the left-hand column of a frequency table like the one shown at the left. Explain how you chose your intervals.
4. Complete the Frequency column in the table.
5. Display the data in a histogram using the results in the frequency table. Explain how you chose the scale for the vertical axis and the labels for the horizontal axis.
6. What does the horizontal axis of the histogram represent?
7. What does the vertical axis of the histogram represent?
8. Can you report the number of observations by reading the histogram? Explain.
9. What conclusions can you draw about the amount of time Samuel spends on the computer?
10. Explain why a histogram is a good display for summarizing this data set.

Exercises

Money Spent at the Gas Station
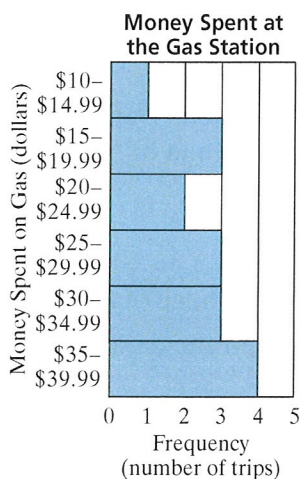
1. The histogram displays Mrs. Sanchez's spending over a six-month period.
   a. What does the bar labeled "$35–$39.99" represent?
   b. How many trips were made to the gas station?
   c. How many times did Mrs. Sanchez spend $25 or more?
2. Mina tracked the points she scored in her basketball games:
   4, 12, 16, 5, 2, 8, 14, 7, 3, 19, 23, 5, 0, 7, 20, 11, 8, 6.
   a. Display the data in a histogram.
   b. How did you choose the intervals for your graph?
   c. What does each axis on the graph represent?

Shape and Variability of Data

You can describe a data set by studying its center, spread, and overall shape. A value that describes how data is centered is called a **measure of center**. The mean, median, and mode are measures of center.

A value that describes how data is spread out, such as the range, is called a **measure of variability**.

ACTIVITY **MATHEMATICAL PRACTICES**

Scientists recorded rainfall amounts in a rain forest for ten days in June.

June Rainfall

Day	1	2	3	4	5	6	7	8	9	10
Rainfall (cm)	5	6	8	16	7	6	1	5	9	7

1. One measure of **variability** is *mean absolute deviation* (MAD). The MAD is the average amount that the data values **vary** from the mean.

   Step 1 Find the mean value of rain over the ten days.

   Step 2 Copy and compete the table below.

June Rainfall Distances From Mean

Day	1	2	3	4	5	6	7	8	9	10
Rainfall (cm)	5	6	8	16	7	6	1	5	9	7
Mean										
Distance from Mean										

   Find the difference between each day's rainfall and the mean to find the distance each day's rainfall is from the mean. Write each difference as a positive number.

   Step 3 Calculate the mean of all the distances in the bottom row. This is the MAD, which is the average amount that the data values vary from the mean.

2. Range is another measure of variability. What is the range of the rainfall data?

Use after Lesson 2-4.

3. Another measure of variability is the *interquartile range* (IQR). This measure tells the spread of the middle half of the data.

   Step 1 Arrange the data values in order from least to greatest.

   $$1 \quad 5 \quad 5 \quad 6 \quad 6 \quad 7 \quad 7 \quad 8 \quad 9 \quad 16$$

   Step 2 Find the lower quartile and the upper quartile.

   $$1 \quad 5 \quad 5 \quad 6 \quad 6 \quad 7 \quad 7 \quad 8 \quad 9 \quad 16$$
   <space>↑<space>↑
   lower quartile   upper quartile

   Step 3 Subtract the lower quartile from the upper quartile. What is the interquartile range?

Vocabulary Tip

The *lower quartile* is the median of the lower half of the data. The *upper quartile* is the median of the upper half of the data.

4. The rainfalls for ten days in July are shown in the table below. Find the mean absolute deviation of the data.

July Rainfall

Day	1	2	3	4	5	6	7	8	9	10
Rain (cm)	3	6	1	0	10	14	8	10	7	11

5. A box-and-whisker plot of the July data is shown below.

Daily Rainfall (cm)
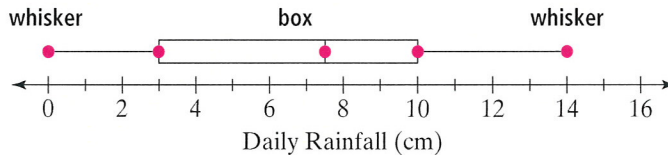
   a. What is the range of the data?
   b. What is the interquartile range?

6. Compare the mean absolute deviation, the interquartile range, and the range of rainfall for ten days in June and July. During which month did the rainfall amounts vary the most?

7. If it rained 21 cm instead of 11 cm during the tenth day in July, 21 would be an *outlier* because it is much greater than the values on the other days.
   a. Recalculate the MAD and the IQR using this new data value and compare them to your first set.
   b. Why is one measure of variability affected more than in the other?

Vocabulary Tip

An *outlier* is a data value that is much greater or much less than the rest of the data.

8. Find the MAD and the IQR for the data in the table below.

Text Messages Sent on Saturday

49	60	21	30
10	7	24	21
24	13	18	47

Another way to describe data is by its overall shape. Sometimes data shapes are symmetrical, while others are higher on the right or on the left. Sometimes data values are grouped around a certain value.

ACTIVITY © **MATHEMATICAL PRACTICES**

The line plot below shows the number of miles a cyclist traveled during a training period.

Cyclist A

```
                    X
              X     X     X
        X     X     X     X     X
        X     X     X     X     X
  _____
   2    3    4    5    6    7    8    9
              Number of miles
```
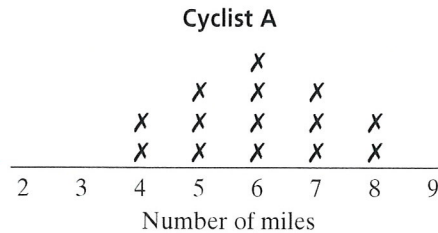
1. In the plot for Cyclist A, the data are grouped around what value?

2. If you draw a vertical line at that value, are the points on either side symmetrical?

3. This line plot shows the distance traveled by another cyclist.

Cyclist B

```
                              X
                        X     X
                        X     X
   X                    X     X
   X     X     X     X  X     X     X     X
  _____
   2    3    4    5    6    7    8    9
              Number of miles
```
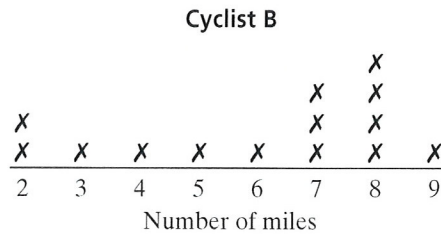
a. Is there a value that the data are grouped around?
b. Are there more data points on the left or the right of the graph?

4. Find the mean absolute deviation for the number of miles each cyclist rides.

5. Which mean absolute deviation shows less variability? Explain how this relates to the shape of the data.

6. The box-and-whisker plot below shows the average gas mileage of two vehicles. Describe the shape of each plot.
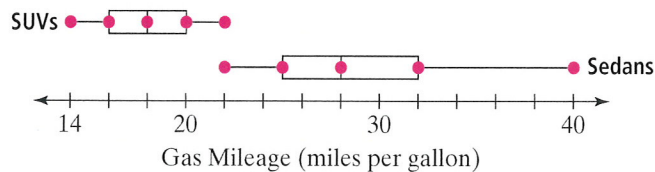
7. What is the interquartile range for SUVs? For sedans?

8. Compare the shapes with their interquartile ranges. How is the shape of a box-and-whisker plot related to variability?

9. Two age groups were surveyed about the hours per week they spend on the internet. The results are shown in the histograms below. Describe the shape of each data set.

Weekly Internet Use (Ages 20–30)

Number of people (vertical axis, 0 to 14)
0–3: 1, 4–7: 7, 8–11: 12, 12–15: 8, 16–19: 2
Hours

Weekly Internet Use (Ages 50–60)

Number of people (vertical axis, 0 to 14)
0–3: 11, 4–7: 9, 8–11: 6, 12–15: 2, 16–19: 2
Hours
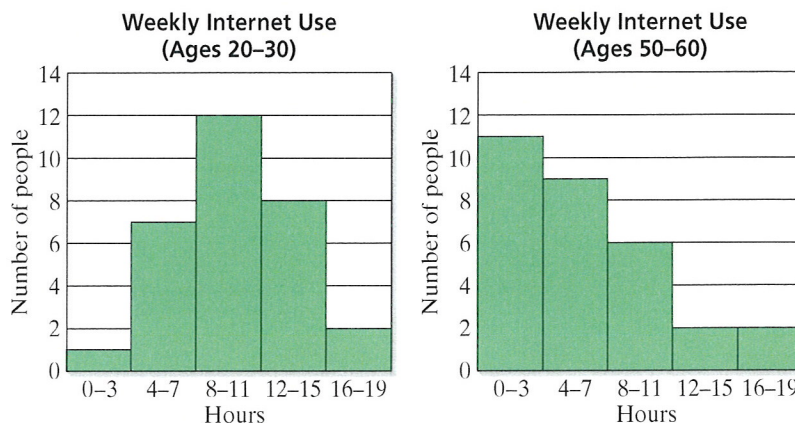
10. In which range of hours would you expect to find the median for each data set?

11. For which graph would you expect less variability in the data? Explain your reasoning.

12. What explanation could you give for the differences in the two sets of data?

Exercises

Use the line plots to answer Exercises 1–4.

Before Tutoring

X
X   X
X X X X X X X
0 1 2 3 4 5 6 7 8 9 10
Score

After Tutoring

X
X
X X X
X X X X X
0 1 2 3 4 5 6 7 8 9 10
Score
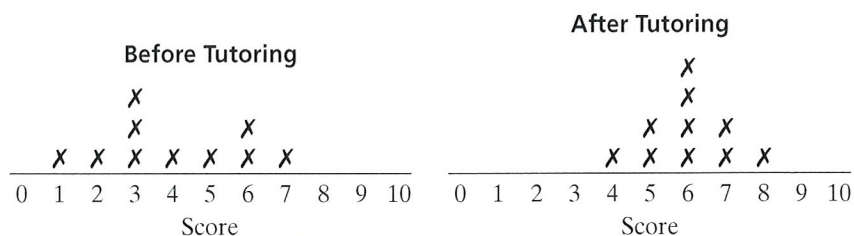
1. Find the mean and median of both data sets.

2. Find the interquartile range and the mean absolute deviation for both data sets.

3. a. What do the measures of center and variability tell you about the data sets?
   b. How do they relate to the shape of the data?

4. Describe the shape of both plots. How might the way in which the data is gathered account for their shape?

Statistical questions have a variety of answers. Some statistical questions have many possible answers, but others have just a few.

ACTIVITY · **MATHEMATICAL PRACTICES**

Sachi asked her classmates, "How many miles do you travel to school?" The table below shows the responses.

Distances Traveled to School

0.8 mile	1.5 miles	0.25 mile
2 miles	1.4 miles	0.5 mile
1 mile	0.75 mile	3 miles

1. Is there variability in the data?

2. Did Sachi ask a statistical question?

3. Explain why this is not a statistical question: "How many miles is the library from the school?"

4. Is each question a statistical question? Explain.

Survey Questions

a. How many siblings do you have?
b. In which month is your birthday?
c. What is your favorite type of book?
d. How many states are in the United States?
e. What color shirt am I wearing?
f. What is your favorite color?
g. How many dogs do you have?
h. What size shoe do you wear?

5. Cora asked, "What are the ages of people who like to watch reality shows?" Is this a good statistical question? Explain.

6. Pauline collected the following results from a survey.

Survey Results

12 miles	28 miles	15 miles	98 miles
10 miles	6 miles	2 miles	36 miles

a. Did Pauline ask a statistical question? Explain.

b. What question might she have asked?
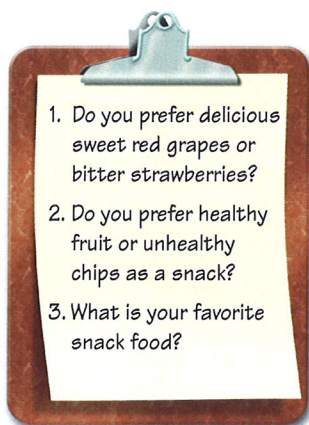
The way a question is worded can cause bias in the data. You cannot draw valid conclusions from biased data.

ACTIVITY © **MATHEMATICAL PRACTICES**

Emelio and Leila surveyed people about vacation spots. Emelio asked, "Would you prefer to vacation in sunny Bermuda or rainy London?" Leila asked, "Would you prefer to vacation in Bermuda or London?"

Survey Results

Emelio		Leila	
Bermuda	Bermuda	London	London
Bermuda	London	Bermuda	London
Bermuda	Bermuda	Bermuda	Bermuda
Bermuda	Bermuda	London	Bermuda

1. Do you prefer delicious sweet red grapes or bitter strawberries?

2. Do you prefer healthy fruit or unhealthy chips as a snack?

3. What is your favorite snack food?

1. How do Emelio and Leila's answers differ?
2. What words did Emelio use in his survey question that might influence the responses to his question?
3. Is either question biased? Explain.
4. Rolando conducted a survey. He wrote his questions on the clipboard shown at the left.
   a. Are any of his questions biased? Explain.
   b. Rewrite Rolando's survey so that the questions are unbiased.
5. Copy and complete the table.

Biased Question	Words Creating Bias	Unbiased Question
a. Do you prefer exciting action movies over boring drama movies?	exciting, boring	▨
b. Do you prefer living in the peaceful countryside or the noisy city?	peaceful, noisy	▨
c. Do you want a delicious chocolate cake or a bland vanilla cake for your birthday?	▨	▨
d. Do you agree with most people that playing the guitar is cooler than playing the clarinet?	▨	▨
e. Do you want to go for a tiring run or play a fun game of soccer?	▨	▨

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Expressions and the Distributive Property

The Distributive Property shows how multiplication affects addition and subtraction expressions. You already learned to use the Distributive Property with numerical expressions. You can also use the Distributive Property with algebraic expressions.

Distributive Property

Numerical Expression	Algebraic Expression
$3 \times (2 + 4) = (3 \times 2) + (3 \times 4)$	$a(b + c) = ab + ac$

The Distributive Property can also be used in reverse. Applying the Distributive Property this way is called factoring.

EXAMPLE **Factoring Number Expressions**

1 Factor $20 + 8$.

$$20 = 5 \times 2 \times 2$$
$$8 = 2 \times 2 \times 2$$
← Find the GCF of 20 and 8. The GCF is $2 \times 2 = 4$.

$$20 + 8 = 4(5) + 4(2)$$
← Write each term as a product of the GCF and its remaining factors.

$$= 4(5 + 2)$$
← Use the Distributive Property.

Test Prep Tip

Check your solution by evaluating the original expression and the solution to see if they have the same value.
$20 + 8 = 28$ and
$4(5 + 2) = 4(7) = 28$, so the answer checks.

✓ **Quick Check**

1. Factor each expression.
   a. $18 + 24$ **b.** $56 + 49$ **c.** $84 + 60$

EXAMPLE **Factoring Algebraic Expressions**

2 Factor $27x + 18$.

$$27x = 3 \cdot 3 \cdot 3 \cdot x$$
$$18 = 3 \cdot 3 \cdot 2$$
← Find the GCF of $27x$ and 18. The GCF is $3 \cdot 3 = 9$.

$$27x + 18 = 9(3x) + 9(2)$$
← Write each term as a product of the GCF and its remaining factors.

$$= 9(3x + 2)$$
← Use the Distributive Property.

✓ **Quick Check**

2. Factor each expression.
   a. $3n + 21$ **b.** $72 + 16h$ **c.** $48y + 80$

Use after Lesson 4-4.

	6x	7
2	12x	14
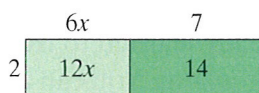
EXAMPLE **Using the Distributive Property with Algebraic Expressions**

3 Write an equivalent expression for $2(6x + 7)$.

$2(6x + 7) = 2 \cdot 6x + 2 \cdot 7$ ← Use the Distributive Property.
$= 12x + 14$ ← Multiply.

Check

$2(6x + 7) \stackrel{?}{=} 12x + 14$ ← Check if the two expressions are equivalent.
$2(6 \cdot 2 + 7) \stackrel{?}{=} 12 \cdot 2 + 14$ ← Substitute a value, such as 2, for x.
$38 = 38$ ✓ ← They are equivalent; your expression is correct.

✓ **Quick Check**

3. Simplify each expression.
  a. $4(3n + 6)$ **b.** $8(7 + 4p)$ **c.** $12(2a + 3b)$

Homework Exercises

GO for Help

For Exercises	See Examples
1–4	1
5–8	2
9–12	3

Factor each expression. Check your solution.

1. $12 + 16$ **2.** $100 + 75$ **3.** $66 + 44$ **4.** $70 + 98$
5. $9x + 12$ **6.** $60x + 16$ **7.** $78x + 36$ **8.** $45n + 90$

Simplify each expression.

9. $3(x + 5)$ **10.** $7(2x + 4)$ **11.** $7(3 + 4n)$ **12.** $8(2x - 3)$

© **13. Guided Problem Solving** The expression $10v + 15w$ represents the cost of admission to a museum for 10 adults and 15 students. Factor $10v + 15w$.
  • What is the GCF of $10v$ and $15w$?
  • $10v + 15w = \boxed{}(\boxed{}v + \boxed{}w)$

14. The expression $80p + 30q$ can represent the area covered by 80 small tiles and 30 large tiles. Factor $80p + 30q$.

15. Algebra The algebra tiles below represent an algebraic expression. Write two expressions to represent the algebra tiles, one simplified and one in factored form.

© **16. Reasoning** Use the Distributive Property to simplify the expression $2x + 7x$.

© **17. Writing in Math** Explain how to use substitution to check whether the expressions $\frac{x + 4}{2}$ and $2x + 2$ are equivalent.

Equivalent Expressions

Equivalent expressions name the same number when any value is substituted for the variable. You can use properties of operations to find equivalent expressions.

EXAMPLE   Using the Distributive Property

1   Find an equivalent expression for $3y + 5y + y$ by simplifying.

$$3y = 3 \cdot y; 5y = 5 \cdot y; y = 1 \cdot y \quad \leftarrow \text{ Find the GCF.}$$
$$3y + 5y + y = 3 \cdot y + 5 \cdot y + 1 \cdot y \quad \leftarrow \text{ Write as products.}$$
$$= y(3 + 5 + 1) \quad \leftarrow \text{ Distributive Property.}$$
$$= y(9) \quad \leftarrow \text{ Simplify.}$$
$$= 9y \quad \leftarrow \text{ Commutative Property.}$$

The expression $9y$ is equivalent to $3y + 5y + y$.

✓ Quick Check

1. Find an equivalent expression for each expression below.
   a. $2b + 3b + 4b$ **b.** $8x + 2x + 3x$ **c.** $3r + r - 3r$

Some parts of an algebraic expression cannot be combined.

EXAMPLE   Generating Equivalent Expressions

2   Simplify $2x + 5 + 6x - 3$.

$$2x + 5 + 6x - 3 \quad \leftarrow \text{ Both } 2x \text{ and } 6x \text{ contain } x.$$
$$2x + 5 + 6x - 3 = 2 \cdot x + 5 + 6 \cdot x - 3 \quad \leftarrow \text{ Write as products.}$$
$$= x \cdot 2 + x \cdot 6 + 5 - 3 \quad \leftarrow \text{ Commutative Properties.}$$
$$= x(2 + 6) + 5 - 3 \quad \leftarrow \text{ Distributive Property.}$$
$$= x(8) + 2 \quad \leftarrow \text{ Simplify.}$$
$$= 8x + 2 \quad \leftarrow \text{ Commutative Property.}$$

The expression $8x + 2$ is equivalent to $2x + 5 + 6x - 3$.

Vocabulary Tip

$2x + 5 + 6x - 3$ and $8x + 2$ are equivalent expressions because they name the same number regardless of which value is substituted for x.

✓ Quick Check

1. Find an equivalent expression for each expression below.
   a. $2b + 8 + 4b - 3$ **b.** $3x + 4 - 4 - x$ **c.** $11 + 3r + r + 1$

Use after Lesson 4-4.

Find an equivalent expression for each expression by simplifying.

1. $7b + b + b$ **2.** $8y + y + 2y$

3. $3x + 4x - 2x$ **4.** $6c - 4c + 5c$

5. $3x - 3x + 1$ **6.** $8 + 4x - 8$

7. $j - 2 + 11j$ **8.** $7 - 3w + 3$

© **9. Guided Problem Solving** Simplify $6x - 5y + 8x + 2y + 11y + 4$.
   - How many different groups can you combine?
   - Check your answer by evaluating the original expression and your answer when $x = 3$ and $y = 5$.

Simplify.

10. $4n + 2p + 15n - 4n - p$

11. $5x + 12 + y - 3x + 7y - 7$

12. $7 + 16a + 3a - 2 + a - 2$

13. $5x + 2y - 3x + y - 5 + 8x$

14. If t is the area of a circle and s is the area of a square, write an expression for the area of the circles and squares.

$$t \quad s \quad t \quad s \quad s \quad t \quad s$$

© **15. Writing in Math** Describe the steps, including the properties of operations, that you would use to generate an expression equivalent to $8.1b + 6.7a + 2.5 + 7 + 0.9a - 2.8b$.

© **16. Error Analysis** Madeline simplified the expression $3r + 6 - r + 2$ as shown below.

$$3r + 6 - r + 2 = 3r - r + 6 + 2$$
$$= 3 + 6 + 2$$
$$= 11$$

Explain the error that Madeline made.

© **17. Open Ended** Write an expression that is equivalent to $x + y$.

18. Algebra Three consecutive even numbers can be represented by the expressions $2n$, $2n + 2$, and $2n + 4$, where n is a whole number. Write the shortest expression you can to represent the sum of the three consecutive even numbers.
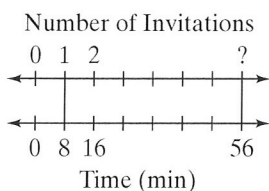
You can use equivalent ratios and rates to solve real-world problems.

ACTIVITY   **MATHEMATICAL PRACTICES**

You are planning a school fundraising event to raise money for new instruments for the school band.

1. You plan to prepare food for the fundraiser. Your mini-cheese turnover recipe needs 3 teaspoons of a cheese mixture for each turnover. Complete the table to show the amount of cheese mixture to the number of turnovers.

Mini-Cheese Turnover Recipe

Cheese Mixture (teaspoons)	3		12		18	30
Turnovers	1	2		5	6	

2. Graph the values in the table on a coordinate plane with the number of teaspoons on the *x*-axis and the number of turnovers on the *y*-axis. Draw a straight line through the points. At what point does the line cross the axes of the graph?

3. What does the point $(0, 0)$ mean for this situation?

4. How can you use the graph to estimate the number of turnovers that can be made with 24 teaspoons of cheese mixture?

5. Jenny is using note cards, glitter, and markers to make invitations for the event. Jenny can make an invitation in 8 minutes. Is this a unit rate? Explain your answer.

6. Explain how to use the double number line below to find the number of invitations she can make in 56 minutes.

Number of Invitations

0 1 2   ?

0 8 16   56

Time (min)

7. After Jenny designed the invitations, four other students made them. The table shows the number of invitations each student made and how long they helped.

Invitation Helpers

	Carlos	Alyssa	Ming	Jamal
Time Helped (min)	50	105	24	96
Number of Invitations Made	4	15	3	16

Who worked the fastest? Justify your answer.

Use after Lesson 7-2.

8. You set up 35 tables. The ratio of rectangular tables to round tables is 6 to 1. Use the tape diagram below to find the number of rectangular tables and the number of round tables.

Rectangular Tables ├──┼──┼──┼──┼──┼──┤

Round Tables ├──┤

9. Explain how you used the diagram to solve the problem.

Exercises

Solve each problem.

1. The table below shows the number of servings that are made for a shrimp salad recipe given the number of shrimp used.

Shrimp Salad Recipe

Number of Shrimp	4		20		32
Number of Servings	1	2		6	

  a. Find the unit rate for the number of shrimp per serving.
  b. Complete the table.

2. You have 32 tablecloths. The ratio of white tablecloths to red tablecloths is 5 : 3. Use the diagram below to find the number of white tablecloths and the number of red tablecloths.

White Tablecloths ├──┼──┼──┼──┼──┤

Red Tablecloths ├──┼──┼──┤
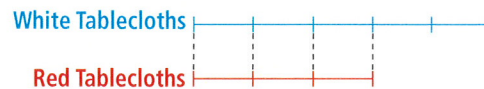
3. The graph shows the relationship between the number of chairs needed for a fundraiser and the number of tables.

Furniture for Fundraiser
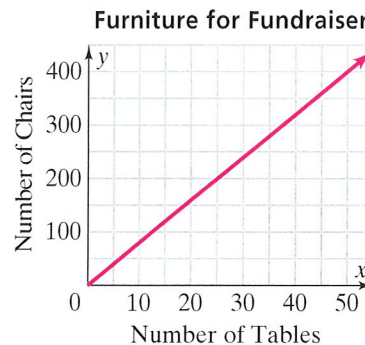
Estimate how many chairs are necessary for 35 tables. Explain how you found your answer.

4. a. The ratio of students to adults at the fundraiser is 2 to 3. If 30 adults attend, how many students are also there?

  b. **Writing in Math** Which method did you use to solve this problem? Explain why you chose that method.

Solving Percent Problems
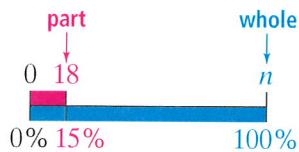
A percent is a quantity out of 100. Sometimes you know the percent of a number and the part that results, but you do not know the whole quantity.

EXAMPLE Finding the Whole

1. A chemical solution must contain 15% sulfuric acid. A chemist has 18 liters of sulfuric acid. How much solution can the chemist make?

Write a proportion to model the situation.

$$\text{sulfuric acid} \rightarrow \frac{18}{n} = \frac{15}{100} \quad \leftarrow \text{part}$$
$$\text{total solution} \rightarrow \qquad\qquad \leftarrow \text{whole}$$
$$100 \times 18 = 15 \times n \quad \leftarrow \text{Write the cross products.}$$
$$1{,}800 = 15n \quad \leftarrow \text{Multiply.}$$
$$n = 120 \quad \leftarrow \text{Divide each side by 15.}$$

The chemist can make 120 liters of the solution.

✓ Quick Check

1. Each house in an old neighborhood has a 2-acre lot. Each lot takes up 5% of the land in the neighborhood. How many acres are in this neighborhood?

EXAMPLE Using Mental Math

2. Thirty sixth-grade students are on the honor roll. This is 20% of the sixth grade. How many sixth-grade students are there?

What you think

$20\% = \frac{1}{5}$; I need to find a number so that 30 is $\frac{1}{5}$ of that number: $5 \times 30 = 150$.

There are 150 students in the sixth grade.

Why it works

$$20\% = \frac{20}{100} = \frac{1}{5} \quad \leftarrow \text{Write 20\% in simplest form.}$$
$$n \times \frac{1}{5} = 30 \quad \leftarrow \text{One-fifth of } n \text{ equals 30.}$$
$$n = 5 \times 30 = 150 \quad \leftarrow \text{5 times 30 equals 150.}$$

Use after Lesson 7-7.

✓ Quick Check

2. Six students in a class received a perfect score on a spelling test. If this is 25% of the class, how many are in the class? Use mental math to solve this problem.

Homework Exercises

Solve each problem.

1. 9 is 15% of what number?

2. 15 is 60% of what number?

3. Josie has a coupon for 35% off art supplies. With the coupon, she saves $7 on a sketchbook.
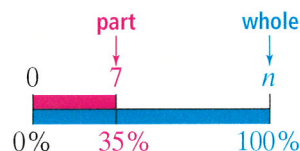
What was the original price of the sketchbook?

4. Of all the seats in a theater, 45% are empty. If 36 seats are empty, how many seats are in the theater?

Solve each problem using mental math.

5. 25 is 10% of what number?

6. 18 is 25% of what number?

7. Suppose you answered 19 questions correctly on a test. If this is 95% of the questions, how many questions were on the test?

8. Twenty adults went on a class field trip. If 10% of the people on the trip were adults, how many people were on the trip?

© 9. Guided Problem Solving A shirt is discounted 40%. Then 10% tax is added to the discounted price of the shirt. The final price of the shirt is $33. What is the original price of the shirt?
  • **Work Backward** What was the price before tax?

10. The final price of a book is $27, after a 50% discount is taken and 8% in taxes are added. What is the original price of the book?

11. A team won 60% of the games they played, and tied 20% of the games. If the team won 12 games, how many did they tie?

© 12. Writing in Math What is the difference between finding n when 60% of n equals 120 and finding n when 60% of 120 equals n?

Converting Measurement Units
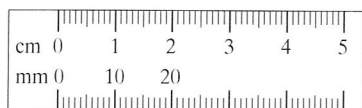
GO for Help
to Lesson 6-7.

You can use ratios to compare quantities, such as measurement units. To convert one measurement to another, multiply the given measurement by a ratio of equivalent measurements.

EXAMPLE **Unit Conversions with Ratios**

1 Convert the measurement.

a. 5 centimeters to millimeters

Multiply the given measurement by a ratio of equivalent measurements. Write the new units in the numerator.

$$5 \; cm = 5 \; \cancel{cm} \times \frac{10 \; mm}{1 \; \cancel{cm}} = 50 \; mm$$

b. 112 cups to gallons

Multiply the given measurement by a ratio of equivalent measurements. Write the new units in the numerator.

$$112 \; cups = 112 \; \cancel{cups} \times \frac{1 \; gallon}{16 \; \cancel{cups}} = 7 \; gallons$$

✓ Quick Check

1. Convert each measurement.

a. 2,500 grams to kilograms   **b.** 4 yards to inches

EXAMPLE **Application: Walking**

2 Jasmine walks 400 yards in 5 minutes. At this rate, how many minutes does it take Jasmine to walk 2 miles?

Step 1 Find the number of yards in 2 miles.

$$2 \; miles = 2 \; \cancel{miles} \times \frac{1,760 \; yards}{1 \; \cancel{mile}}$$
$$= 3,520 \; yards$$

Step 2 Find the number of minutes Jasmine needs to walk 3,520 yards. Since Jasmine walks 400 yards in 5 minutes, use those measurements as a ratio to find how long it takes her to walk 3,520 yards.

$$3,520 \; yards = 3,520 \; \cancel{yards} \times \frac{5 \; minutes}{400 \; \cancel{yards}}$$
$$= 44 \; minutes$$

It takes Jasmine 44 minutes to walk 2 miles.

Use after Lesson 9-2.

2. Three pints of water leak from a water tank in 2 minutes. How long will it take for 18 gallons of water to leak from the tank?

Homework Exercises

Convert each measurement.

1. 8 grams to milligrams
2. 48 ounces to pounds
3. 1,550 meters to kilometers
4. 6 cups to quarts
5. 6.5 liters to milliliters
6. 0.45 kilometers to centimeters
7. $\frac{1}{2}$ yard to inches
8. $2\frac{3}{4}$ tons to pounds

Solve each problem using ratios and proportions.

9. An ant walks 42 feet in 3 minutes. How long will it take the ant to walk 28 yards?

10. A dog needs 2 teaspoons of medicine for every 10 pounds of weight. How many teaspoons of medicine are needed for a 240-ounce dog?

GPS

ⓒ 11. **Guided Problem Solving** Chris can walk 4 feet per second. How many miles does Chris walk in 2 hours? Round your answer to the nearest tenth of a mile.
   - Use a proportion to convert hours to seconds.
   - Find the number of feet he walks.
   - Convert the number of feet to miles.

12. A faucet leaks 75 milliliters of water per minute. How many liters of water does the faucet leak in 3 hours?

13. A cleaning solution uses 2 cups of vinegar for every 3 quarts of water. How many cups of vinegar are needed to make a cleaning solution containing 3 gallons of water?

14. A marathon runner runs 560 meters in 2 minutes. How many minutes will it take the runner to run 42 kilometers at that rate?

15. An airplane is flying at 450 miles per hour. How many yards does the airplane fly in 30 minutes?

ⓒ 16. **Error Analysis** Serena used the proportion $\frac{1\text{ lb}}{16\text{ oz}} = \frac{x\text{ oz}}{4\text{ lb}}$ to convert 4 pounds to ounces. Is Serena correct? Explain.

ⓒ 17. **Writing in Math** Explain what happens to the *number* of units when converting from a larger measurement unit to a smaller measurement unit, and when converting from a smaller measurement unit to a larger measurement unit.

Super Mart Distilled White Vinegar

Directions: For general cleaning, use 2 cups per 3 quarts water.

# Prisms with Fractional Edge Lengths

Volume is the space inside a three-dimensional figure. The number of unit cubes it takes to fill the space inside the figure shows its volume. You can also use cubes with side lengths other than 1 unit to fill the space. The cube at the right has edges that are $\frac{1}{2}$ centimeter long.
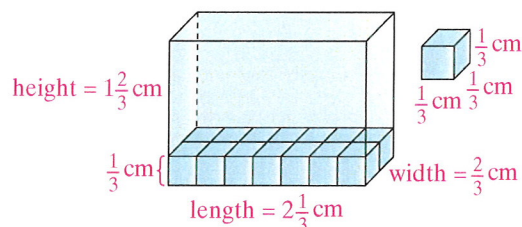
$\frac{1}{2}$ cm
$\frac{1}{2}$ cm
$\frac{1}{2}$ cm
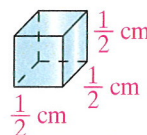
ACTIVITY MATHEMATICAL PRACTICES

1. Consider the rectangular prism at the right. How many $\frac{1}{2}$ centimeter cubes are needed to fill the base of the prism?

   $\frac{1}{2}$ cm
   height = 1 cm
   width = 1 cm
   length = 2 cm

2. How many 1 centimeter cubes would be needed to fill the base?

3. If the prism is filled with $\frac{1}{2}$ centimeter cubes, how many layers high is the prism?

4. How many layers high would the prism be if it were filled with 1 centimeter cubes?

5. How many $\frac{1}{2}$ centimeter cubes are needed to fill the entire prism?

6. What is the volume of one $\frac{1}{2}$ centimeter cube?

7. What is the total volume of the $\frac{1}{2}$ centimeter cubes needed to fill the entire prism?

8. Use the formula $V = Bh$ to find the volume of the prism.

9. How does the formula $V = Bh$ relate to the total volume of the $\frac{1}{2}$ centimeter cubes needed to fill the entire prism?
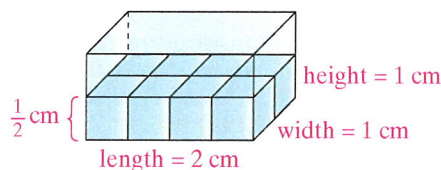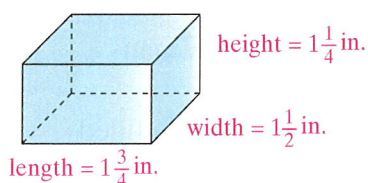
ACTIVITY MATHEMATICAL PRACTICES

1. Consider the rectangular prism at the right. How many $\frac{1}{3}$ centimeter cubes are placed along the length of the prism?

   height = $1\frac{2}{3}$ cm
   $\frac{1}{3}$ cm
   $\frac{1}{3}$ cm
   $\frac{1}{3}$ cm
   $\frac{1}{3}$ cm
   width = $\frac{2}{3}$ cm
   length = $2\frac{1}{3}$ cm

Use after Lesson 9-9.

2. How many are placed along the width?

3. Use multiplication to find the number of $\frac{1}{3}$ centimeter cubes it takes to fill the base of the prism.

4. How is this related to multiplying the length and width of the prism to find the area of the base?

5. If the prism is filled with $\frac{1}{3}$ centimeter cubes, how many layers high is the prism?

6. How many $\frac{1}{3}$ centimeter cubes are needed to fill the entire prism?

7. What is the volume of one $\frac{1}{3}$ centimeter cube?

8. What is the total volume of the $\frac{1}{3}$ centimeter cubes needed to fill the entire prism?

9. Use the formula $V = lwh$ to find the volume of the prism.

10. How is the solution you found using the formula $V = lwh$ related to the number of $\frac{1}{3}$ centimeter cubes needed to fill the prism?

ACTIVITY   © **MATHEMATICAL PRACTICES**

height = $1\frac{1}{4}$ in.

width = $1\frac{1}{2}$ in.

length = $1\frac{3}{4}$ in.

1. You have cubes with edge lengths of $\frac{1}{4}$ inch, $\frac{1}{3}$ inch, and $\frac{1}{2}$ inch. If you only use one size of cube, which can you use to fill the container at the left? Explain.

2. How many small cubes do you need to fill the entire prism?

3. What is the volume of the prism? Justify your answer.

Exercises

1. A storage unit has a floor area of $15\frac{3}{4}$ square meters. The height of the unit from floor to ceiling is $6\frac{1}{2}$ meters. Which formula should you use, $V = Bh$ or $V = lwh$? Find the volume of the storage unit.

2. Julia is filling a crate with wood chips. The crate is $2\frac{1}{2}$ feet long, $3\frac{3}{4}$ feet wide, and $1\frac{2}{3}$ feet high. How many cubic feet of wood chips will she need to completely fill the crate?

3. A cereal box is $9\frac{1}{2}$ inches high, $6\frac{1}{2}$ inches long, and $2\frac{3}{4}$ inches wide. A second cereal box has a base area of $16\frac{1}{4}$ square inches and a height of $10\frac{1}{4}$ inches. Find the volume of each cereal box. Which has a greater volume?

Rational Numbers and the Coordinate Plane

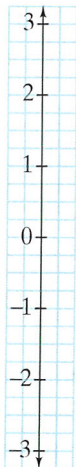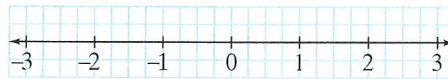The set of whole numbers and their opposites are integers. Every integer can be written as a quotient of two integers, so every integer is also a rational number.

ACTIVITY **MATHEMATICAL PRACTICES**

1. On graph paper, copy the horizontal number line below.

Find and position the rational numbers $1\frac{1}{2}$, 2.25, -1, $-1\frac{1}{2}$, 1, and -2.25 on the number line.

2. Use a vertical number line like the one at the left to find and position the rational numbers $2\frac{1}{2}$, 1.75, $-2\frac{1}{2}$, and -1.75.

3. On graph paper, combine the horizontal and vertical number lines so that they intersect at 0.

Vocabulary Tip

A vertical number line is perpendicular to a horizontal number line.
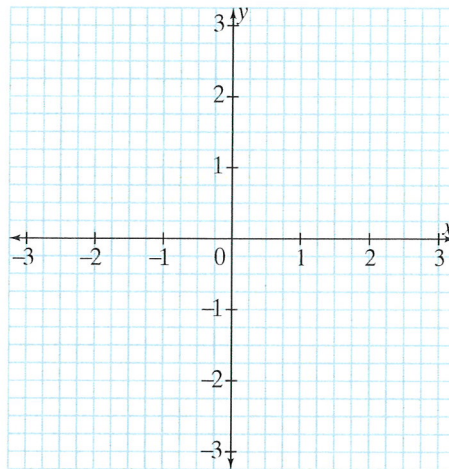
a. Find and position the following pairs of rational numbers on the plane. Then connect them in the order listed.

$(1, -1.25), \left(-1\frac{1}{2}, -1\frac{1}{4}\right), (-2.25, -0.5), \left(1\frac{3}{4}, -\frac{1}{2}\right), (1, -1.25)$

b. Position and connect these pairs of rational numbers on the plane: $(-1, -0.25), (-1, 2.25), \left(\frac{1}{2}, -\frac{1}{4}\right),$ and $(-1, -0.25)$.

Use after Lesson 11-8.

ACTIVITY © **MATHEMATICAL PRACTICES**

Malika and her friends are at a lakeside park. At one point, Malika notices the position of each of her friends.

Malika	standing next to the lake
Sasha	diving 6 feet below the surface
Jerry	climbing slide ladder 5 feet above the lake
Kim	climbing slide ladder 2 feet above the lake
Damon	swimming 2 feet below the surface
Xiau	climbing slide ladder 8 feet above the lake

1. Order the friends from highest elevation to lowest depth.

2. Use absolute value to order the friends from closest to the surface of the lake to farthest from the surface of the lake.

3. Describe the difference between ordering the friends by elevation and ordering them by distance from the surface.

4. How are comparisons of absolute value different than statements about order?

Homework Exercises
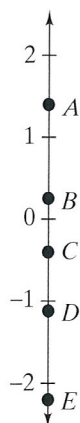
1. Match the numbers $\frac{1}{4}$, -2.2, $-1\frac{1}{8}$, 1.4, and $-\frac{2}{5}$ with the points on the vertical number line at the left.

2. Draw a large coordinate grid with maximum values of 2 and minimum values of -2. Connect each group of points.

   a. $(0.6, 1.4)$, $(-0.6, 1.4)$, $\left(-\frac{4}{5}, 1\right)$, $\left(-\frac{4}{5}, \frac{1}{5}\right)$, $(-0.6, -0.2)$, $\left(\frac{3}{5}, -\frac{1}{5}\right)$, $(0.8, 0.2)$, $(0.8, 1)$, and $\left(\frac{3}{5}, 1\frac{2}{5}\right)$

   b. $(-0.2, 1)$, $(-0.5, 1)$, $(-0.5, 0.6)$, $\left(-\frac{1}{5}, \frac{3}{5}\right)$, and $\left(-\frac{1}{5}, 1\right)$

   c. $\left(\frac{1}{2}, 1\right)$, $\left(\frac{1}{5}, 1\right)$, $(0.2, 0.6)$, $(0.5, 0.6)$, and $(0.5, 1)$

   d. $(-0.4, 0.2)$, $(-0.2, 0)$, $\left(\frac{1}{5}, 0\right)$, $\left(\frac{2}{5}, \frac{1}{5}\right)$, and $\left(-\frac{2}{5}, \frac{1}{5}\right)$

3. Seven students are exploring a cavern. Four of the students are at depths of -5 meters, -13 meters, -9 meters, and -2 meters relative to sea level. At the same time, three students are at heights of 3 meters, 8 meters, and 5 meters relative to sea level.

   a. List the student's elevations from lowest to highest.

   b. List the student's depths from closest to farthest to the surface of the water.
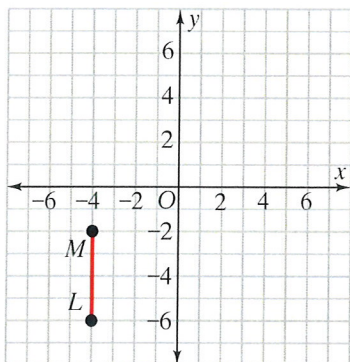
Horizontal and Vertical Distances

You can use the coordinates of points to find the horizontal or vertical distance between them.

ACTIVITY **MATHEMATICAL PRACTICES**

1. Compare the points $A(-2, 3)$ and $B(4, 3)$.
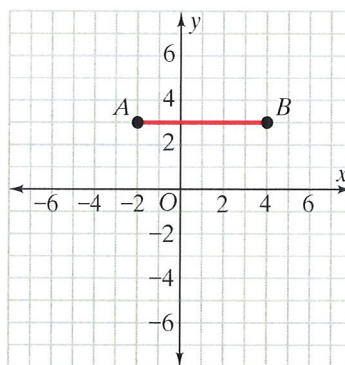
How are they alike or different?

2. Is the line segment *horizontal* or *vertical*?

3. By counting units, find the length of the line segment.

4. a. How far is point A from the y-axis?
  b. How far is point B from the y-axis?
  c. Explain how to use the coordinates of the points to find the length of the line segment.
  d. What is the length of the horizontal line segment joining the points $C(-9, 205)$ and $D(4, 205)$?

5. Use the graph at the left to answer the questions.
  a. Is the line segment connecting the points $L(-4, -6)$ and $M(-4, -2)$ *horizontal, vertical*, or *neither*? Explain how the coordinates of the points show this.
  b. How far is each point from the x-axis?
  c. Use the coordinates of the points to find the distance between them. Justify your reasoning.
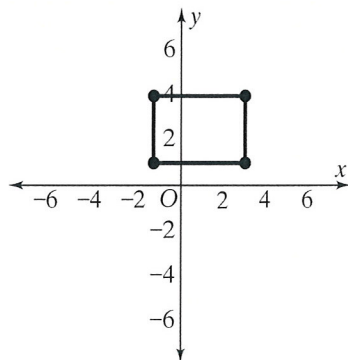 **d.** Find the length of the line segment between $P(x, 7)$ and $Q(x, -5)$.

Vocabulary Tip

A horizontal line segment is level, like the horizon.

You can use the coordinates of a polygon's vertices to find the lengths of its sides.

Use after Lesson 11-8.

1. The points $(3, 4), (3, 1), (-1, 1),$ and $(-1, 4)$ are connected to form a quadrilateral.

   a. What is the best name for this quadrilateral?
   b. Apply what you know about the lengths of horizontal and vertical line segments to find the lengths of the sides of the quadrilateral.
   c. What is the perimeter of the quadrilateral?

2. A square has a perimeter of 16 units. One of its vertices is at $(3, -1)$.
   a. What is the length of each side of the square?
   b. Give possible coordinates for the other three vertices of the square.
   c. Is there more than one square that has a perimeter of 16 units and a vertex at $(3, -1)$? Explain.

Homework Exercises

Find the length of the line segment joining the two points.
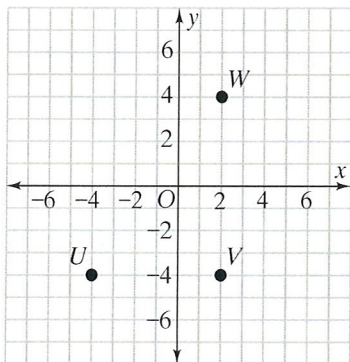
1. a. Find the length of a line segment joining points U and V.
   b. Find the length of a line segment joining points W and V.
2. $(2, 5), (9, 5)$
3. $(4, 0), (4, -12)$
4. $(-7.5, -6.25), (19.5, -6.25)$
5. $(5, 9), (5, 2)$
6. $(0, 0), (0, -7)$
7. $(9.25, 1.5), (-9.25, 1.5)$
8. $(-1.2, -1.2), (-1.2, 3.6)$
9. $(0, 0), (-7, 0)$

For Exercises 10–13, the two given points are connected to form the diagonal of a rectangle. Find the perimeter of the rectangle.

10. $(4, 5), (-4, -5)$
11. $(3, 3), (-3, -3)$
12. $(-1, 2), (1, -2)$
13. $(-5, 5), (5, -5)$

Variables and Equations

A **function** is a rule that assigns exactly one output value to each input value. Variables are used to represent the input and output values. Equations show how the variables are related.
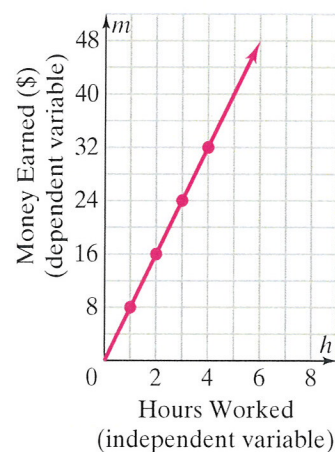
ACTIVITY   **MATHEMATICAL PRACTICES**

Caroline earns $8 per hour working at a local pet store. The table, graph, and equation below show how the money m she earns relates to the number of hours h she works.

Equation: $m = 8h$

Hours Worked (h)	Money Earned (m)
1	$8
2	$16
3	$24
4	▨

Money Earned ($) (dependent variable) vs. Hours Worked (independent variable)

1. What is the missing value in the table?
2. What does this value represent?
3. The input variable is also called the *independent variable*. Which variable is the independent variable?
4. The output variable is the *dependent variable*, because it depends on the input variable. Which variable is the dependent variable?
5. What does the point $(3, 24)$ on the graph represent?
6. Describe how the equation can be used to find the amount Caroline earns when she works 6 hours.
7. A canoe travels down river at 4 miles per hour.

Time (hours)	Distance (miles)
1	▨
2	▨
4	▨
▨	28

   a. Copy and complete the table to show how the distance the canoe travels relates to the number of hours it travels.

b. Determine the dependent and independent variable by asking, "Does distance depend on time or does time depend on distance?" Choose a variable to represent each.

c. Use the information in the table to draw a graph.

d. Write an equation. Describe how this equation relates to the table and the graph.

Exercises

Identify the independent and dependent variables in each situation. Then write an equation to represent the situation.

1. Kristi walks at a rate of 3 miles per hour. What is the total distance d she walks after t hours?

2. Tyree is 7 years older than Monica. What is Tyree's age t, in years, when Monica is m years old?

3. Tuan wants his rectangular garden to be 2 feet longer than it is wide. What will be the length l if the garden is w feet wide?

Represent each situation with a table, a graph, and an equation.

4. A spring stretches 3 centimeters for each gram of weight attached to it.

   a. Complete the table to show the length s the spring stretches when an amount of weight w is attached.

Weight in Grams (w)	Stretch in Centimeters (s)
1	3
2	
5	
	24

   b. Use the table to draw a graph of the relationship between the amount of weight and the length of stretch.

   c. Write an equation to represent the relationship.

5. Juanita earns $5 for each magazine subscription she sells.

   a. Write an equation to represent the relationship between the number of subscriptions she sells and the amount earned.

   b. Use the equation to make a table with at least four values and graph the values.

   c. Would you use the table, the graph or the equation to predict how much Juanita earns for 35 subscriptions?

6. Ben can type 25 words per minute.

OVERSET MATTER

   a. Write an equation make a table with at least four rows, and draw a graph to represent how many words per minute Ben types.

   b. How many words can Ben type in 15 minutes?